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62.61 Prince's
The following is the last Botanical Work from the pen of Dr. Prince. It was issued in March, 1869, before the close of which month, he suddenly died. In this connection, the opening sentence acquires additional significance.

PRINCE & CO., Flushing, N. Y.

CHINESE NORTHERN YAM.

DIOSCOREA BATATAS,

AND ITS FIFTY VARIETIES, OF EVERY FORM AND OF VARIOUS COLORS.

HISTORY OF ITS CHARACTER AND CONSTITUENTS, AS THE CHEAPEST AND MOST NUTRITIOUS OF ALL FOOD, AND AS A SOVEREIGN PREVENTIVE OF WANT AND FAMINE.

By WM. R. PRINCE, M.D., L.L.D.,

-LINNEAN -NURSERIES, FLUSHING, NEW-YORK, March 1, 1869.

THE NORTHERN YAM.

THIS remarkable plant is a native of Northern China and Tartary, and the northern limits of the Temperate Zone. Having been the first to introduce this most important of all Esculents to our country, and to urge its adoption by my countrymen, more especially of the Northern, Eastern and Western States, I have declared in my previous publications, that when I shall have passed from earth, I solicit no other boon from my country, than the recognition of whatever services I may have thus rendered to my brother man, by the introduction of this plant as a sovereign and permanent provision of cheap and nutritious food for the poor, and as an absolute preventive of famine throughout all time. When making our first experiment with this Esculent, some of our cultivators having heard of the Chinese practice adopted there in extreme cases of scantiness of land, when trenching four or five feet is pursued, assumed therefrom the erroneous idea that this was the necessary culture required. Nothing could be more erroneous. The usual growth of the root is 10 to 12 inches in length, and such is the average crop in ordinary farm culture, an extra growth to 15 or even 20 inches may be forced by deeper culture and more deeply enriching the soil. But we now have eight varieties of every form. Some are round, some ovate, others short oval, others a longer oval, and then we have oblong varieties that average 5 to 6 inches in length, and others averaging about 7 to 8 inches, and longer ones of 10 to 12 inches in length. They vary in color, several varieties having snow white flesh, others straw color, yellow, and others of a reddish tinge. Thus every cultivator can choose a variety to suit himself, the same as with potatoes. In the vicinity of Pekin, 40° north, they cultivate more than fifty varieties, which are particularly described in their Agricultural Books. These improved varieties have not been obtained by chance, as our seedling potatoes have been, but societies have devoted their special attention to the attainment of superior improved varieties for ages before Europe had emerged from its barbarism.

I have announced the Chinese Northern Yam to be the most important Esculent as food for Man, which God and Nature, in their benign provision for our race, have placed upon our globe, and I base this assertion on the following facts :

No other plant which has ever been proposed as a substitute for the potato has presented claims so meritorious, and so well entitled to success as this, whose various estimable properties place it among the most desirable acquisitions of the Vegetable department.

1st. Its hardihood and the capacity of withstanding the cold of the most frigid climes during the winter in the open ground.

2d. Its facility and simplicity of culture, so readily comprehended by any laborer, and its adaptation to such a variety of locations, and seemingly to all soils; but more especially to such light and hitherto neglected lands as have been deemed valueless for other Agricultural purposes.

3d. Its Productiveness and Cheapness, in which it far exceeds the potato, or any other vegetable. When its culture shall be properly established, the crop of the long varieties will not be less than 600 to 800 bushels, and of the round and oval varieties 400 to 500 bushels to the acre, and still more is ardently and confidently looked for. Its propagation is more rapid than that of any other esculent, and it is thereby proven to be, in proportion to its actual value and importance, the most cheaply produced of all food.

4th. Its Nutritious and Farinaceous qualities, comprising the essential constituents of an Esculent of the highest alimentary character. It will fill the positions of both Meat and Wheat as aliment, the flour made from it surpassing in pure whiteness and farinaceous excellence the best obtained from wheat, with which it is destined hereafter to come into successful competition on account of its cheapness. It also possesses a peculiar distinctive character superior to all other Vegetables, from its combination of Nitrogen, the same constituent as is existent in Meat, which thus becomes blended and assimilated with properties the same as are found in the best Wheaten flour, in Corn Starch, and in Milk.

It therefore presents the distinctive characteristics of substances essentially alimentary, and meat as food is rendered entirely unnecessary.

5th. Its unexceptionable excellence of flavor, and freedom from any sweet, acid or insipid taste, as is the case with most other proposed substitutes, and its congenial accordance with the entire human organism. Some contend that its flavor is a combination of the best Potato and Arrowroot.

6th. Its long keeping and freedom from all decay, as it never rots in the ground or out of it.

It retains its excellence for more than a year, thus rendering it of pre-eminent importance under every contingency, and especially so in long sea voyages, and as its character is anti-scorbutic, it furnishes a preventive against scurvy and similar diseases. I have myself preserved the roots in an ordinary cellar without any extra care until June of the second year, when they were firm and sound, free from all sprouts, and in perfect condition. They may be kiln dried and thus preserved for the various uses for an indefinite period of time.

7th. It is a purifying and highly nutritious Constitutional Food, beneficial to the mind as well as to the body, and capable of developing the muscular power of man to its fullest capacity.

8th. The root being perfectly hardy, the crop, when desired, may be allowed to remain the entire winter in the open ground, or may be buried in burrows during autumn, ready when required for winter use.

STATEMENT OF JACOB RAYNOR, OF QUEEN'S COUNTY, LONG ISLAND, N. Y.

November 26th, 1868.

I commenced the culture of the Chinese Yam, in April, 1867, with four tubers, and in April, 1868, I obtained six more, making ten tubers in all. These were all obtained from Mr. Prince, of Flushing. The stock grown from the

above has now increased to 2,650 tubers and 169 large yams. The largest weighs 1 lb. I have boiled some for ten minutes, and eaten them; and I have given some to my neighbors, and they have eaten them, and nearly all of them thought they were the best and richest potatoes they had ever eaten.

The Crops of this Esculent having been so great, permanent, and reliable for countless ages in the vast Chinese Empire, it is a fair and legitimate assumption that its general introduction among the other great food-producing nations of the world must, in time, by its immense product, create a complete revolution in the price of food, and by a gradual diminution in price reduce the cost of living everywhere, and more especially in all the northern climes of the earth, where heretofore there has been a comparative scarcity of food, as this best of aliments can be grown at a much cheaper rate than any other can be supplied, the cost in China being equivalent to $\frac{1}{4}$ c. per day to a man. It will also render all deficiency of food an impossibility, which, taken in connection with the nutritious constituents of this root, cannot fail to have an important bearing on the health and vigor of the people at large. It will thus become the grand Conservator from famine, not only of our country, but of every other country that shall adopt its culture, the same as it has for so long proven to China and Japan, which vast nations its ample crops have preserved unvaryingly against all such calamities, whilst other countries have so frequently suffered from the direst visitations of famine.

In the East Indies, and the immense Asiatic dominions under British control, extensive famines often prevail, which carry off from half a million to a full million of the inhabitants; and even in the Northern countries of Europe, where civilization and its appliances exist, we hear of frequent famines, and even Ireland, the land pre-eminent for its potato crop, has been many times most severely afflicted by a severe dearth of food, which in some cases has approached a famine. And even during the past year, such was its condition; and a famine existed also in Northern Germany, and in part of Russia.

But we have now presented for our acceptance, an Esculent, combining every element of excellence, which is precisely adapted to the most Northern regions where man abides, and one which will there supply from their own soil and labor, all the food adequate to the requirements of humanity.

It is a highly interesting scientific fact, that the enigma which had so long puzzled the brains of our professed thinkers, and who could fix on naught but Rice as the alimentary basis of this vast Nation which consumes no meat, when reflection would teach us Rice was an impossibility on account of its required irrigation has at last been solved, and that its Agricultural statistics prove to us that the cultivation of this Yam, so nutritious and so universally productive, is as general and the varieties as numerous as in the Potato culture with us, and they thus reveal to us still further, the astounding fact that if the vast middle and northern regions of that mighty Empire, populated by more than 350 millions of happy and contented people, were deprived of this one vertical root, and received in lieu of it, every other known vegetable of the earth more than one-half of that enormous population would perish from famine. It is not only used by them in its natural state after being boiled or roasted, but it also supplies universally the flour or meal for general use in the making of bread, pastry, &c. In fact, it is this one esculent which has constituted the alimentary diet of the Chinese and Japanese Empires for countless ages. As a most remarkable fact in the history of the most populous Nation of our globe, and as an evidence of intelligence most wisely applied where necessity most demanded, we quote from their statistics this fact. It is there recorded that in certain Districts where the dense population is greatly in excess of the area of soil, they have

recourse to an artificial mode of culture. They trench the ground five feet deep, and place the entire deposit of manure at the bottom, leaving the other portion of the soil sterile. When thus prepared, they select a peculiar variety of the Yam, which has a propensity to penetrate deeply, and this root seeking for the aliment below penetrates to the depth of 40 inches, forming immense roots, and yielding thus a treble crop. By this mode of culture they obtain from a space of land 12 feet by 3, a sufficiency of food to sustain a man a year. It would seem that Nature desired to impart to this plant every estimable characteristic required as a special provision for an abundant crop of the long varieties of this Yam, and that these were in exact accordance with what the circumstances demanded in the Chinese Empire, the regular vertical growth of the root without any branching; it thus occupying no extra space in the earth, but allowing for the entire occupancy by the greatest possible number of plants in a given space.

Another important fact is, that the roots of the long varieties penetrate so deeply into the earth, that no drought can affect them, and they evidently draw a larger portion of their nutrition from the depth of the earth than from the atmosphere, as is plainly evinced by the comparatively diminutive development of vines and foliage. These points, when duly considered, must be deemed most important and interesting facts for the reflective mind. In the Chinese Agricultural Books we find more pages devoted to the culture of this Esculent, and to the descriptions of the many varieties than to any other Agricultural object whatever. Why is this, and how is it to be accounted for, except by the greater appreciation of its National importance? We find there that a plantation of this root is termed, "A permanent Magazine of Food," and that the roots are dug for use every day throughout the year, thus always furnishing a fresh supply of what we should term, "New Potatoes." We further find that when this plantation or magazine of food is once established, it does not require renewal annually, but that the small sections of roots which are broken off and the numerous tubers produced, continually replenish all exhaustion, in the same manner as is done in our Horse Radish fields. In China, where the area of land is so disproportionate, the hill sides which would otherwise be useless, are terraced and planted with this root, which seemingly will flourish anywhere. The plantations cover every available location, and are denominated by them "A Grand National Resource." This Yam furnishes flour of a purer whiteness than wheat, and which surpasses it in nutritious and farinaceous excellence, and may be applied to all similar purposes as food. It supplies all their bread, and is used in pastry and every other way. It is furthermore declared to be highly beneficial to invalids, and especially so in diseases of the chest, and to be the great preventive of consumption, a disease which seems to be unknown in that country. And indeed, its nitrogenous constituent would impart to it this character, and more especially so when a total abstinence from meat as food exists, which is of itself one of the greater promotives of Consumptive affections.

Why has this Esculent been hitherto Unknown?

To the many inquiries, why we have not obtained this important Esculent before, I answer, that our only intercourse with China until of late years was interdicted to Canton, a port within the Tropics, and from which we obtained only tropical products, one of which was the Chinese Tropical Yam—*Dioscorea Sativa*—long cultivated extensively in the West India Islands, and elsewhere in the Tropics, but which is entirely unsuited to Northern latitudes. It was not until Shanghai and other ports of Northern China were opened, more than a thousand miles distant from Canton, that we became familiarized with the productions of Northern China and Tartary, extending to the limits of the Tem-

perate Zone. And even after that event, much delay resulted from an erroneous idea that this Yam, which they cultivated at the North, was identical with the species which we had long previously obtained from Canton. Most fortunately, however, Mr. Montigny, then French Consul, discovered its distinctive character; and in a collection of Chinese productions he transmitted a few roots to France. I was so fortunate as to obtain some of the first crops of tubers, but a root was an impossibility. It was at a critical period of our Potato rot, and I at once realized its immense importance to our country, as a God given substitute for that failing and uncertain esculent which seemed destined to an entire abandonment. And when we consider and realize the fact that we have the same genial temperature as Northern China, the same glowing and vivifying sunshine, with a dry and warm Summer climate, precisely assimilating with theirs, we may feel assured that this Chinese Yam will find here as favorable combinations of climate and soils as in its native regions; and our experience thus far has proven that we shall not fail to obtain the same vast product of this most estimable esculent from our own fields, as has been for ages lavished on that favored but secluded Oriental nation, whose existence we have almost ignored; a Nation whose triumphant attainments in Agriculture, like to their attainments in Science, in the Arts, and even in a pure and spiritualized Religion, date back to a period in the world's history, thousands of years before the then barbarian Nations of Europe imparted to mankind the slightest scintillations of light and of knowledge, to illumine the path of man's benighted history.

Positive and Conclusive Facts Assuring us of its Successful Culture in our Country.

There are some great and imposing considerations for the favorable adoption and positive success of the culture of this Esculent in our country, which seem to never have attracted attention, nor to have been duly considered. The Chinese Empire comprises nearly the same latitudes as our own country, with a variation in climate of only two degrees in corresponding latitudes from that of our Atlantic States. China, furthermore, presents the same slope to the Ocean and the same characteristic position as our Atlantic front. This climatic affinity is most strikingly recognized by Nature in the similarity of Vegetable productions; and there are more than twenty genera of trees and shrubs, with numerous species, which are nowhere to be found except in China and North America.

Soil and Preparation.

A light and permeable soil is the most suitable. It may be entirely sandy, or a sandy loam. Even the sandy Atlantic shore-lands of Long Island, New Jersey, and the entire coast range, hitherto deemed barren and almost useless, may be appropriated successfully to its culture, and they all will be so in after time.

The plants seem to flourish best with occasional rains, and the humid atmosphere near the sea coast would therefore seem to be very favorable to their growth.

The ground should be well ploughed and harrowed, as is usual in farm culture, say to the depth of twelve inches, and be thus rendered mellow and permeable. The manure should be as thoroughly mixed throughout the soil as is possible. The preferable manure is decayed leaves, or the decomposed vegetable mould which is found in the forests, or decayed and pulverized peat. Old decomposed stable manure may also be used, but all fresh stable manures and poudrette are unsuitable. Of the manufactured artificial manures, some may without doubt prove suitable for permanent use. This depth of ploughing is amply sufficient for the Prolific White, Pekin White, and for all the round, globular, and ovate varieties. Amateurs who may desire to grow the Long White variety, and to grow roots of 18 to 20 inches in length, will use a deep plough and mellow the

earth to a proportionate depth, by which means they will of course obtain a double crop, more difficult, however, to get out, except with the improved beet and carrot ploughs, or until we adapt some new ploughing machine to the purpose, which mechanical ingenuity will doubtless soon provide. In light, sandy soils, the labor will be comparatively easy, and in all cases the increased crop will cover any extra expense many times over.

Field Planting.

For regular crop, the Roots are usually cut into sections of about $1\frac{1}{2}$ inches in length. These when cut should be spread for 48 hours, and the sap thereby allowed to pass off from the cuts, which will then dry up. Where the tillage is to be performed by the hoe, the Roots should be placed 9 inches apart in the row, and the rows 12 inches asunder; this last course rendering the Roots equidistant throughout. Although the roots are covered with countless minute eyes, provided by Nature for her wise purposes, the most minute section of which will vegetate, and does so in the renewal of the field crops, I recommend that no sections be planted of less size than I have above named. In Field culture of small Tubers, where no crop can be looked for but small roots, they are usually planted in rows 8 inches asunder, and distant 5 to 6 inches in the row.

The planting here recommended is where the cultivation would be by the hoe. Hereafter a course of field culture will be adopted, where the plough and harrow will be used, and then the most simple course of culture will be adopted, precisely the same as with the common potato, but in rows instead of in hills, and the distance of the rows will in like manner be adapted to the plough. The usual crop has been elsewhere stated.

Crop from Tubers.

The growth of the vines is similar to the Sweet Potato, and they run over the ground, or ascend any poles or bushes placed for the purpose. Each tuber of the long varieties, produces one straight root, differing in length according to the variety, some 10 to 12 inches, and others 12 to 18 inches, and the round, globose and oval varieties produce roots of their respective character. These roots usually weigh from 8 oz. to $1\frac{1}{2}$ and 2 pounds each. The new tubers are produced at the axils of the leaves, and when the plants are well cared for, they average 20 to 35 to each vine, and often more. The blossoms are very diminutive, but fill the air with a delicious Cinnamon perfume, and the vines are consequently very often trained on piazzas and trellises as valuable appendages. Some persons place a pole about 5 feet in height to each plant and train the vines thereon, but in general they allow the vines to trail on the ground the same as the sweet potato.

Garden Planting.

For the present, whilst both Roots and Tubers are comparatively scarce, a system may be pursued which, by allowing more facilities for culture, will be sure to realize more extensive crops. For the attainment of this object, I propose that the rows be 20 to 24 inches apart, and that the tubers be set at 12 to 15 inches apart in the rows. This is the course I at present adopt for my own planting, and it will probably prevail for some time, whilst the roots continue scarce and of great value. Any extra attention to weeding and to culture will of course be beneficial as with every other garden production.

Period of Planting.

Its hardihood against all frosts and cold admits of its being planted at the first opening of spring, long before the potato can be trusted, which gives to it the great advantage of a prolonged season for growth. The planting should be

performed as promptly as possible after the frost has left the ground and it has become settled, and after planting no fears need be entertained as to any subsequent frosts or freezing, as the root or tuber when in the ground will withstand any cold. No manure should come in contact with the roots or tubers at the time of planting. The roots should be covered with about two inches of earth, and the tubers with one inch. Early planting by extending the season has proven so highly beneficial by the increase of the crop, that I think fall planting will be eventually adopted as preferable, the winter freezing being no preventive, as it does not injure the roots. By a course of fall planting it is supposed that the crops will be increased fully 20 per cent. It is found that the greatest increase in the size of the roots takes place after the summer heat is passed, and during the autumnal months, when the weather has become cooler, which proves the great advantage of a prolonged season. It is therefore best to defer digging the crop for winter use till the latest possible period.

Wintering the Crop for Use.

The crop desired for winter use can be ploughed out or dug out during the autumn, at any time most convenient before the ground freezes. The stock of roots may then be buried in suitable burrows, or be placed in a cellar ready for daily family use. It is the usual practice to cut off the slender neck (upper portion) of the root, and to place these aside for spring planting, and then to store the main roots for use. These should be allowed to dry for some days before being packed away for the winter.

Present Prospects of Cultivators of this Yam.

The number of persons who have hitherto devoted their attention to the culture of this Esculent has been very limited, but they are now rapidly increasing, as the public attention seems greatly attracted to its importance, so that every day purchases are made by amateurs, who will ardently engage in the culture the coming season. And indeed, nothing can be more tempting in a lucrative point of view, as there must, for 3 or 4 years to come, be a most active demand for all the surplus roots and tubers which the growers will spare. These will be quickly purchased by the many who will be attracted by this new pursuit as soon as the knowledge becomes general, and the present cultivators of the potato, will, on account of its rot and other maladies, gradually abandon it as unreliable and unprofitable, and adopt the Yam on account of its hardihood, the certainty of its crops, and its admirable properties. The potato, in past time, has been called the poor man's bread, but with how much greater justice may we give to the Chinese Yam this favorable appellation.

Supersedure of the Potato in all Northern Climes, and throughout our Northern, Eastern and Western States.

The introduction of the Tropical Potato from the coast region of South America, has led to a continual war against Nature in our endeavors to acclimate a tender plant, subject, at all times, to the maladies of a new location and climate, and always destructible by frost to the plant, or by freezing to the root itself. Grown under these adverse conditions, its culture could only be extended so far North as the length of the summer would permit, by a sufficiency of time for the maturity of the root. The precarious culture of this plant has been of late years so dubious and unreliable, subject to the rot and other diseases, and to utter blight and decay, that the frequent results have been the destruction of entire crops, at periodical returns, which has proven mostly calamitous to its cultivators. Thus, a great scarcity has often resulted, with enhanced prices for this hitherto indispensable article of food.

This combination of untoward circumstances, so fatal to this plant, has caused reflective minds to seek for an appropriate substitute.

Our Agricultural statistics show, that in the State of Maine, the crop in 1867 was but 16 per cent., and that in numerous years, it has proven a total failure, not only there, but in parts of several of the Middle States, and throughout almost the entire Western States, where in fact they no longer look upon the culture of the potato as worthy of further attention.

The price which some years since was but 25 cents per bushel, has now advanced to \$1 and \$1.50, which has a most oppressive influence on the poorer classes who have always been large consumers.

The past year, 1868, the cold and frequent rains in Maine and other Eastern States which continued until the middle of June caused the Potatoes to rot in the ground. In numerous Counties of Illinois and Michigan, the Potato bug has become a permanent destroyer, so that many declare that reliance on its future culture is out of the question. In other Western and Northern States the Potato culture has been attended with the most discouraging results. It may therefore be readily foreseen, that the time is approaching when this tender and unreliable Tropical root is destined to an entire rejection and abandonment, not only by our Northern, Eastern and Western States, but by the British Provinces.

How auspicious then is the discovery and the advent to our Country of the Chinese Yam, which we may justly hail as the crowning gift of an all-beneficent Providence. Henceforth, when deploring the disastrous blights, failures and disappointments, which have changed our Potato fields from former health to their present decay, we may confidently congratulate ourselves on the attainment of a grand desideratum, a substitute far more estimable in all its properties than the Potato, a hardy and vigorous plant, a native of countries still colder than our own, and which combines within itself all the characteristics that our most ardent desires could have demanded.

This Chinese Yam will first supersede the Potato in our Northern, Eastern and Western States, whence its culture will be extended to the vast British Territories at the north, until it becomes everywhere the grand basal constituent for food of all Northern America, where the Potato and Indian Corn never have been and never can be grown, thus providing those regions now being opened to the world with ample alimentary resources, as it has already done to China, Japan, Tartary and all Northern Asia. Its culture will also be adopted throughout Northern Europe to which it offers the only reliable protection against the scanty product of their present Agricultural productions. Ireland will become a complete Yam storehouse not only for itself, but for supplying its needy northern neighbors.

But little foresight of our mental vision is required to realize the momentous results which will be consummated when this nutritious, excellent, and abundant product of food is thus disseminated, thereby developing the ever progressive and benign purposes of God and Nature, in their ample provision for the destinies of Humanity. But the mighty and boundless area for which God and Nature have designed this Esculent as the most gladdening and beneficent boon, destined to occupy a controlling position as the most important alimentary basis, comprises the vast Western regions of our own Country, stretching over our entire Continent to the shores of the Pacific, and extending its Herculean arms grasping on the one side the polar north, and on the other that Isthmus which is to become the channel through which we shall ere long command and extend our vast commerce with the world.

In this mighty domain of intelligence and industry, will in the future ages be found the teeming millions, equalling and perhaps surpassing the vast aggregate of the Chinese and Japan Empires, and all sustained and cherished by the same nutritious, healthful, and purifying food.

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